



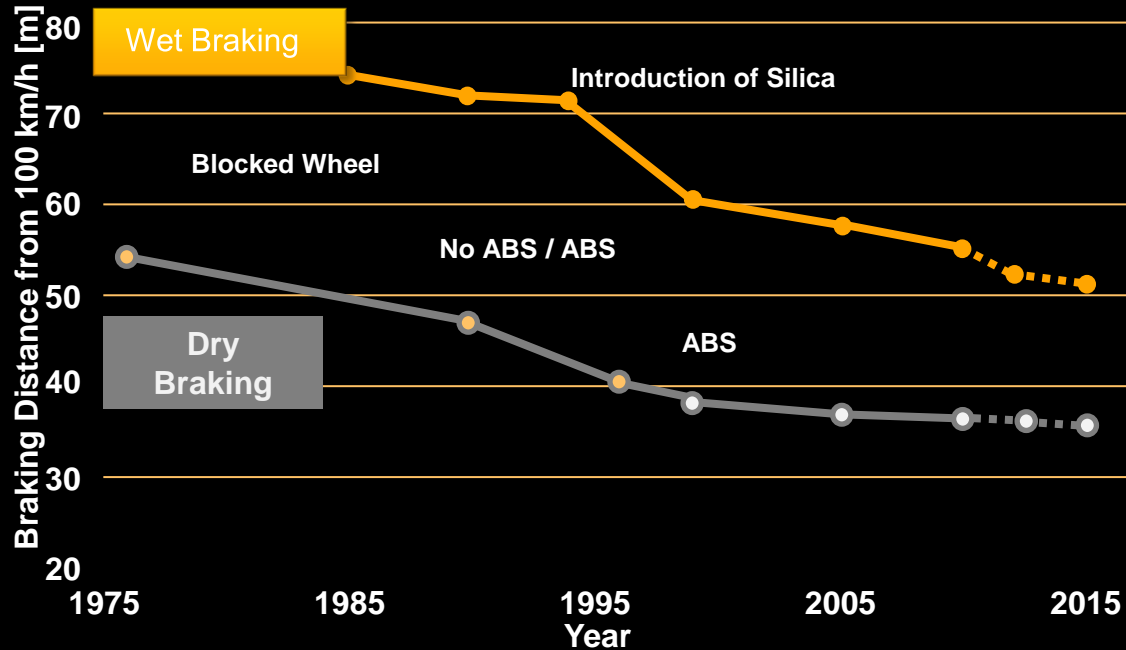
Advances in Tire Technology

NTSB Tire Symposium – December 9, 2014

Jay Spears

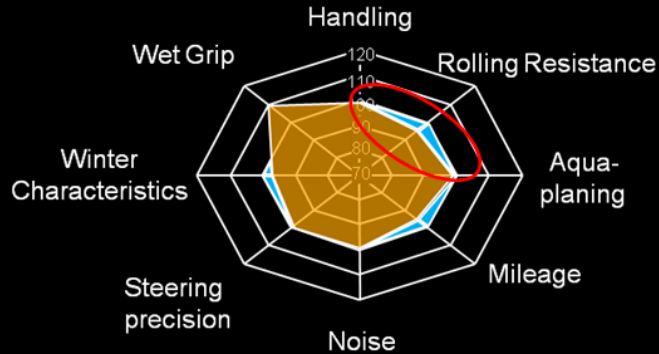
Director of Standards and Regulations, the Americas

Historic development in dry and wet braking performance



Challenges in conflicting development goals

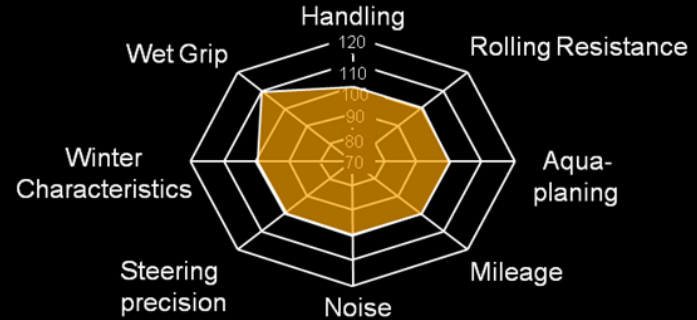
Managing the Target Conflicts



Optimization of tire performance by:

- › Understanding of the physics of tires and the interaction of the individual parameters
- › Simulation to ensure tire performance in respective time and quality

Leaps in Technology

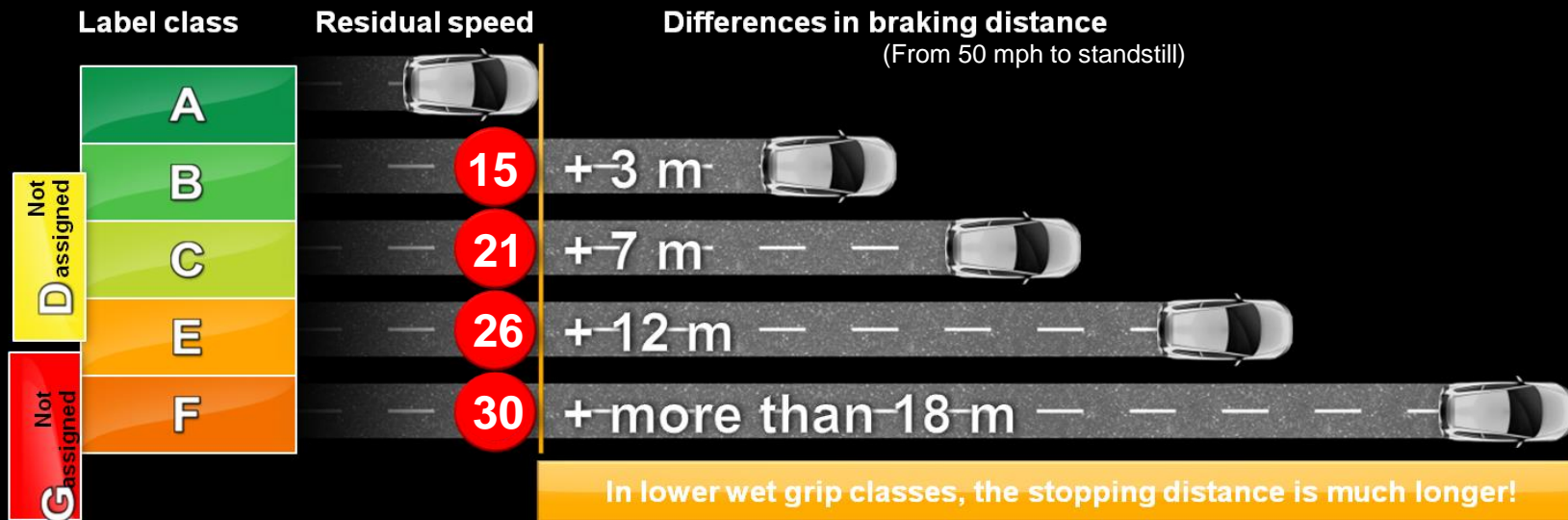


Increase of the overall level of individual criteria by further developing the potential in specific sectors:

- › Compound technology
- › Construction (tread, tire design)
- › Process technology
- › ...

Safety performance

Even small improvements can make a big difference



Continental invested in innovative testing technology

AIBA – Automated Indoor Braking Analyzer

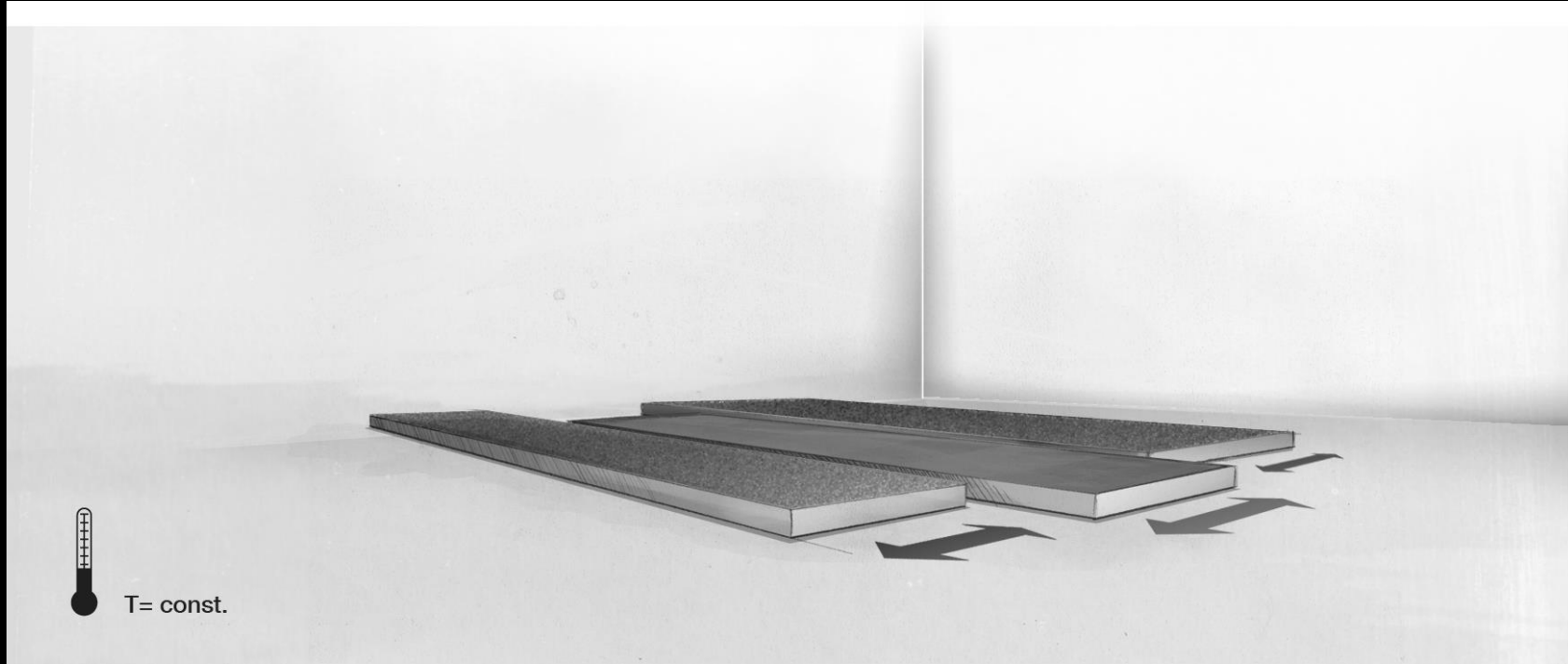
- › Improvements in safety performance are possible but at small steps
- › In order to be able to measure such small differences and build future development on stable results Continental invested in innovative testing technology



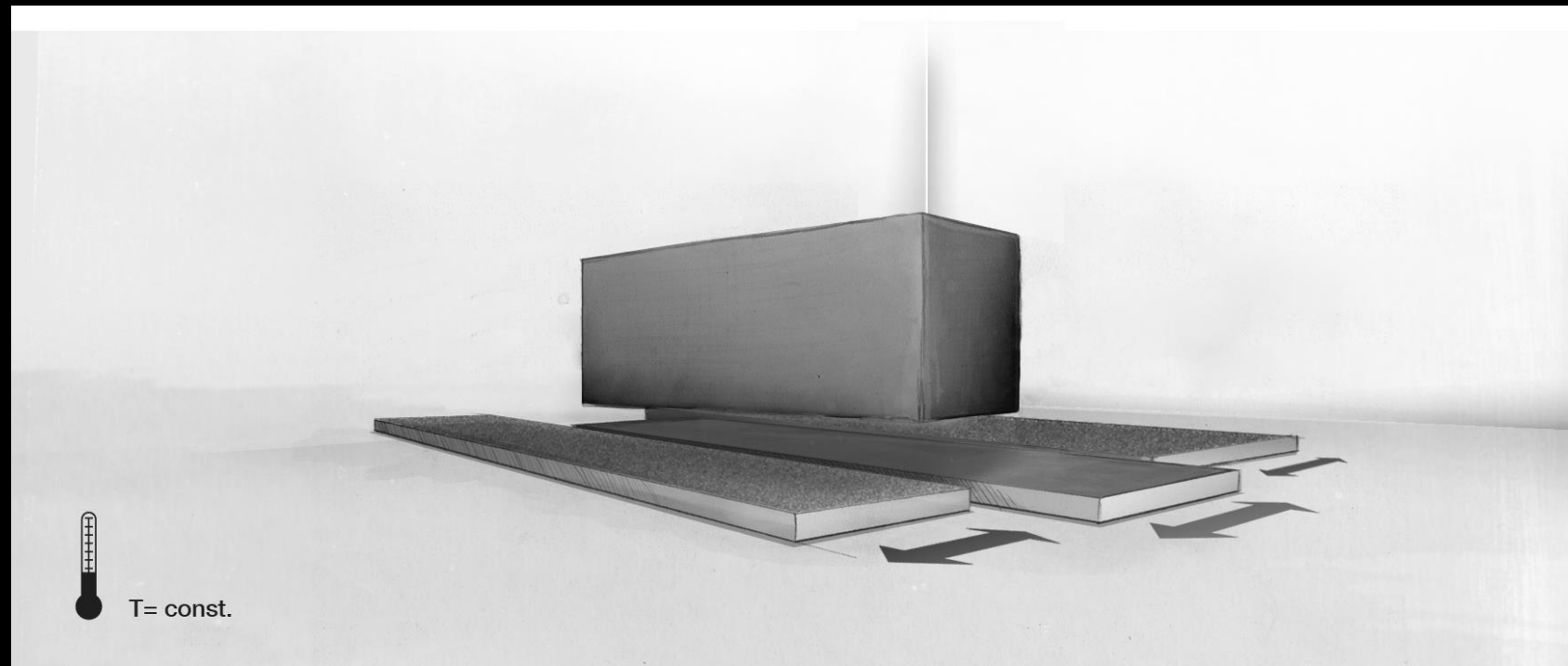
Revolution of Testing Technology

Laboratory	ALBA	Vehicle Test
Precision <ul style="list-style-type: none"> ▶ Temperature ▶ Surface ▶ Water Depth ▶ Reproducibility 	Precision <ul style="list-style-type: none"> ▶ Temperature ✓ ▶ Surface ✓ ▶ Water Depth ✓ ▶ Reproducibility ✓ 	Precision <ul style="list-style-type: none"> ▶ Temperature ✗ ▶ Surface ✗ ▶ Water Depth ✗ ▶ Reproducibility ✗
Reality <ul style="list-style-type: none"> ▶ Pattern Effect ▶ Rolling Tire ▶ ABS ▶ Pressure Distribution ▶ Load Dynamics 	Reality <ul style="list-style-type: none"> ▶ Pattern Effect ✗ ▶ Rolling Tire ✗ ▶ ABS ✗ ▶ Pressure Distribution ✗ ▶ Load Dynamics ✗ 	Reality <ul style="list-style-type: none"> ▶ Pattern Effect ✓ ▶ Rolling Tire ✓ ▶ ABS ✓ ▶ Pressure Distribution ✓ ▶ Load Dynamics ✓

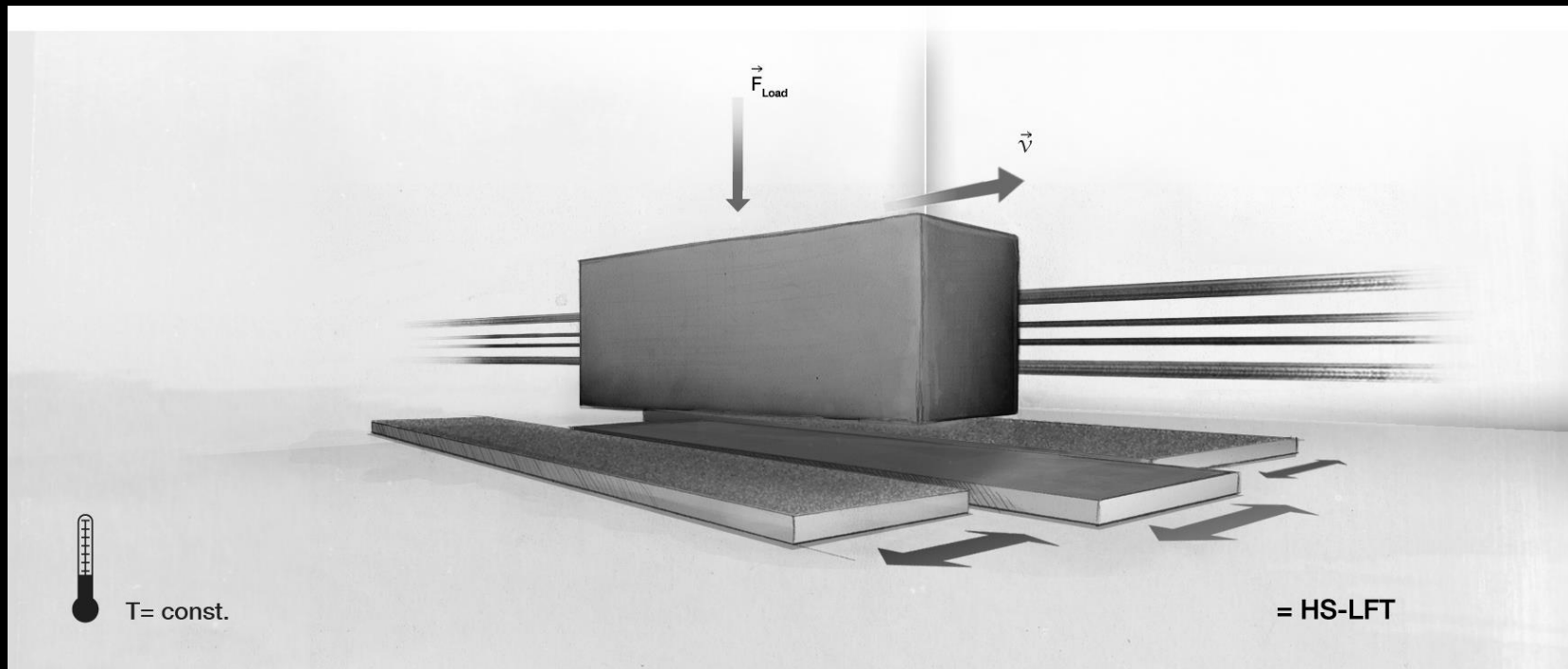
› Concept of High Speed Linear Friction Tester (HS-LFT)



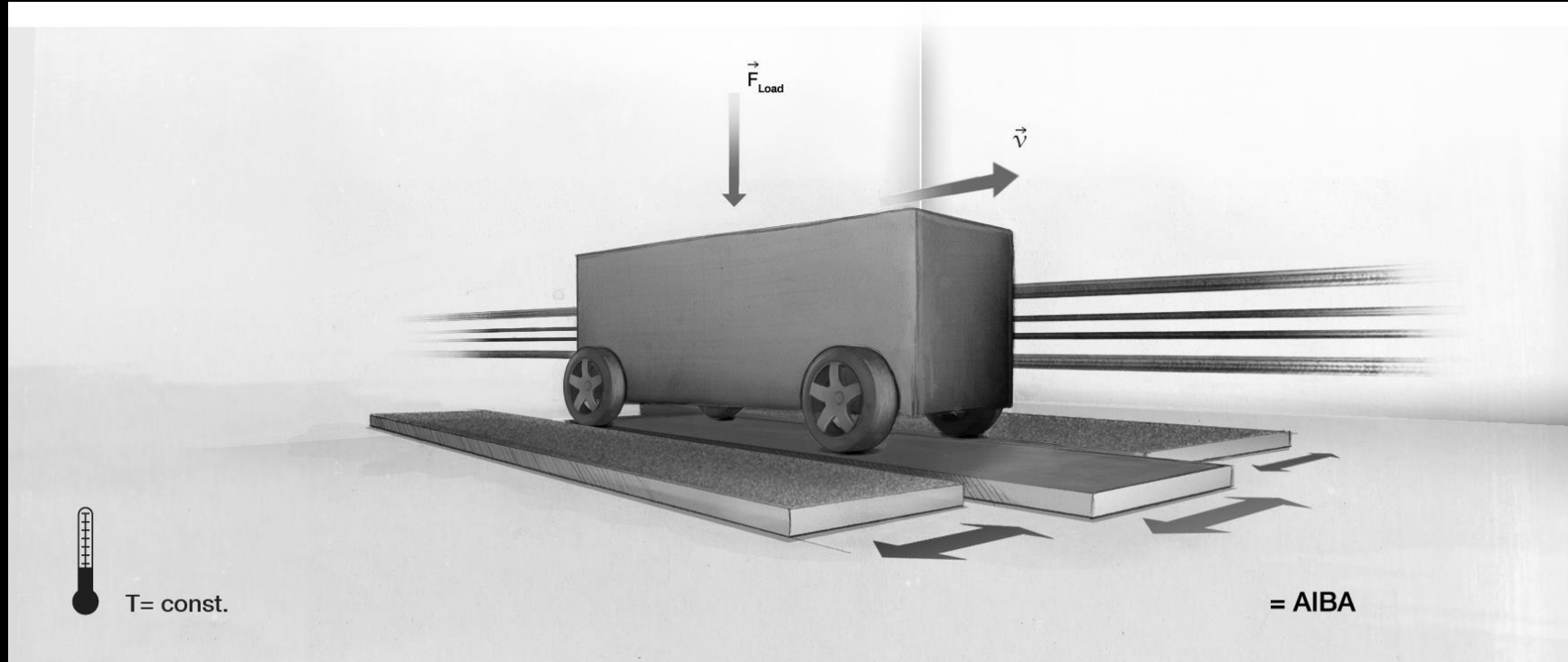
› Concept of High Speed Linear Friction Tester (HS-LFT)



› Concept of High Speed Linear Friction Tester (HS-LFT)

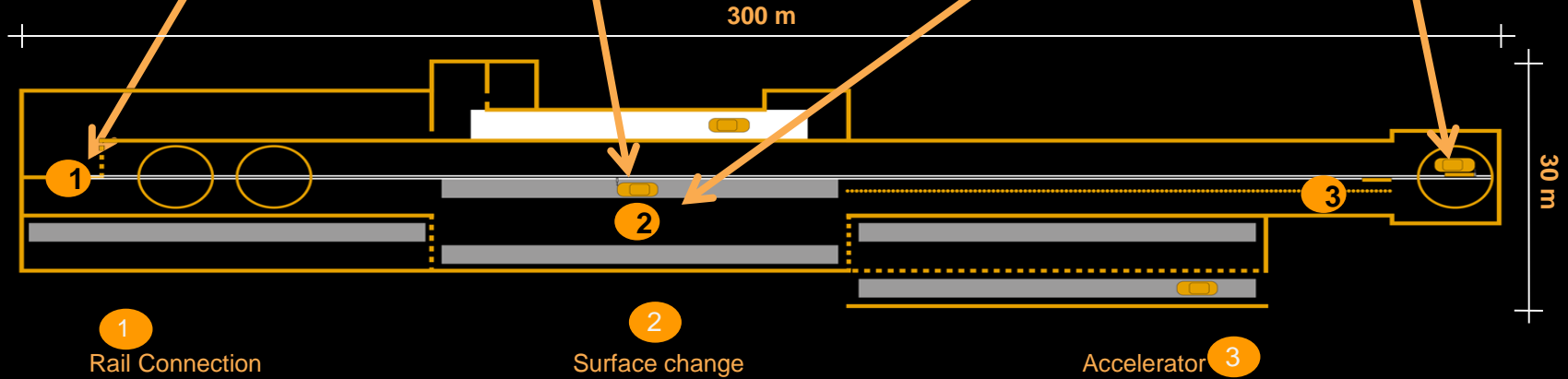


Concept of Automated Indoor Braking Analyzer (AIBA)





Automated Indoor Braking Analyzer



Ice Hall

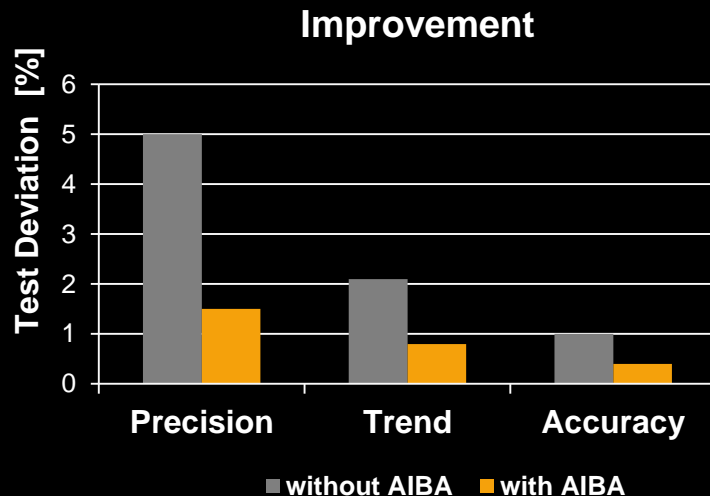
- › Indoor testing of traction and braking on ice
- › Controlled surface and air temperature conditions
- › Ice temperature adjustable from $-10\text{ }^{\circ}\text{C}$ to $-1\text{ }^{\circ}\text{C}$
- › Air temperature adjustable from $+5\text{ }^{\circ}\text{C}$ to $+12\text{ }^{\circ}\text{C}$
- › Significant improvement of test precision on ice



Benefits and Improvement of test quality

Test quality is determined by

- › **Precision:** Same test results in repeated tests
- › **Trend:** Stable results within test series
- › **Accuracy:** Correctness of measured values



AIBA Summary

- | | | |
|---|---|--|
| ▶ Indoor braking vehicle test | ➡ | All year testing (dry, wet, ice) |
| ▶ Air conditioning | ➡ | Full control of temperature by $\pm 1\text{ }^{\circ}\text{C}$ (precision) |
| ▶ Exchangeable surfaces | ➡ | Full control of road friction level $\mu = \pm 0,05$ (precision) |
| ▶ Automated operation
(complete vehicle) | ➡ | No physiological impact on test drivers (health) |
| | ➡ | Increase in efficiency (growth) |
| | ➡ | Automated (emergency) braking system
by Continental's Chassis and Safety Division |

Improvement of precision by 70%

Thank you
for your attention!